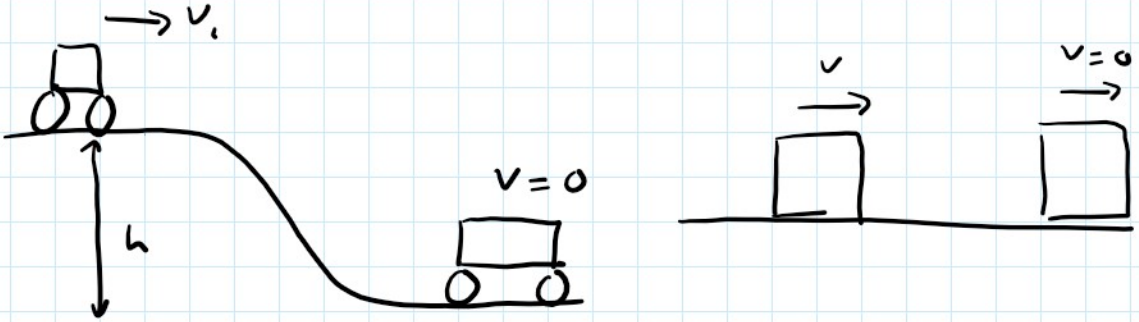
Quiz 3 Review

Wednesday, March 15, 2023 6:57 PM

Conservation of Energy

$K_i + U_i + W = U_f + K_f$



$$\frac{1}{2}mv_i^2 + mgh_i + W = mgh_f + \frac{1}{2}mv_f^2$$

$$W = \int F\,ds \qquad W_R = \int M\,d\theta$$

$ds = r\,d\theta$ assuming r is cst

$$\int F r\,d\theta = \int M\,d\theta \qquad \int M\,dt = \int F r\,dt$$

$$v = \int a(t)\,dt \qquad F = ma, \quad a = \frac{F}{m} \qquad \int M\,dt = r\int F\,dt$$

$$v = \int \frac{F(t)}{m}\,dt$$

$$m(v_{t_2} - v_{t_1}) = \int_{t_1}^{t_1} F(t)\,dt$$

$$m v_{t_2} = \int_{t_1}^{t_2} F(t)\,dt + m v_{t_1} \quad \text{trans}$$

$$I\omega_2 = \int_{t_1}^{t_2} M\,dt + I\omega_1 \quad \text{ang}$$

EQ sheet

$$I\omega_1 + \int_{t_1}^{t_2} M\,dt = I\omega_2 \quad x$$

$$m v_1 + \int_{t_1}^{t_2} F\,dt = m v_2 \quad x$$

$v = r\omega$ $\quad s = r\theta$ $\quad a = r\alpha$ $\quad F = ma$

$KE + PE + \omega = PE + KE$

trans
$\frac{1}{2} m v^2$

rotation
$\frac{1}{2} I \omega^2$

PE
Grav
mgh

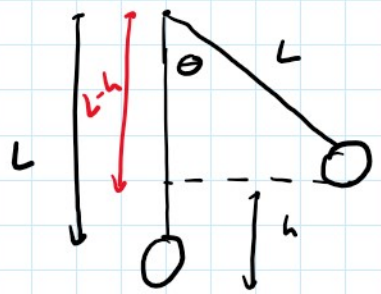
Spring
$\frac{1}{2} k x^2$

tran + rot

$\frac{1}{2} m v^2 + \frac{1}{2} I \omega^2$

I_{bar} $\quad I_c$

Derivation of $1 - \cos\theta$ for pend



$$\cos\theta = \frac{L-h}{L}$$

$$L\cos\theta = L - h$$

$$h = L(1 - \cos\theta)$$

$$I\omega_1 + mv_1 + \int_{t_1}^{t_s} \Pi \, dt + \int_{t_1}^{t_2} F \, dt = I\omega_2 + mv_2$$

$$v = r\omega$$